REMARKS/ARGUMENTS

Claims 10 and 12-20 remain in this application. Claim 11 has been canceled and claims 10 and 20 have been amended in order to more particularly define the invention. Basis for these amendments is found at page 3, line 21, page 4, lines 7-8, and page 5, lines 28-33 of the specification. Reconsideration of this application in view of these amendments and the following remarks is respectfully requested.

The Examiner has rejected claims 10-12, 14 and 18 of the application under 35 U.S.C. §103 as unpatentable over Schanke et al., GB 2 322 633 (Schanke) in view of Dettling et al., U.S. Patent No. 4,335,043 (Dettling). This rejection is respectfully traversed for the following reasons.

To briefly review the references, Schanke teaches monolithic catalysts and processes for conducting Fischer-Tropsch (F-T) gas-to-liquid conversions. F-T conversions are conversions wherein gaseous mixtures of H2 and CO2 are reacted in the gas phase to produce a liquid hydrocarbon product. As the F-T reaction is highly exothermic, Schanke utilizes the liquid product as a coolant by recirculating cooled product liquid through the honeycomb catalyst along with the reactive gas mixture. Among the catalysts used by Schanke to conduct the F-T process are square-channeled honeycomb catalysts wherein the channels have been internally coated with layers of catalytically active material.

Dettling broadly teaches monolithic catalyst support members incorporating channel cross-sections with rounded corners, and methods for using them. The advantage of these structures is that they maybe be coated with catalyst materials without leaving unwanted and uneconomic accumulations of catalyst in inaccessible corner locations within the monolith channels (column 3, lines 6-17 of the patent). The Dettling structures are designed and intended for use as catalyst supports for gas treatment processes, particularly processes involving the treatment of automotive exhaust gases (column 1, lines 6-20 of the patent). Thus while Dettling indicates general utility for the treatment of gases (or liquids), there is no disclosure of any actual liquid treating process, either inherent or express, nor any indication that reaction efficiency is enhanced or degraded within the disclosed catalysts.

In rejecting claims 10-12, 14 and 18 of the application on reference to Schanke and Dettling the Examiner has characterized Schanke as disclosing a gas/liquid/solid reaction carried out within a honeycomb. However, the reaction of Schanke is strictly a gas-phase reaction, i.e., a reaction wherein CO gas and H2 gas are reacted to form higher hydrocarbons (page 2, lines 5-8 and 31-34 of the reference). The liquid present in the Schanke reactor is hydrocarbon product liquid only, and it is present as a recirculating stream only for the purpose of reactor heat management (page 5, lines 24-30 of the reference). Thus there is in fact no liquid reactant in the Schanke process, and no suggestion that any hydrogen-liquid reaction occurs.

The Examiner has noted the teaching of Schanke to the effect that that excessive catalyst layer thickness can interfere with the selectivity of the F-T process. Schanke's concern is that excessive reactant diffusion lengths can decrease reaction selectivity toward higher (C5+) hydrocarbons (page 4, lines 2-17 of the reference). Based on this disclosure the

Examiner suggests that the use of a thin-layer Dettling catalyst free of angled corners in the Schanke process would have been obvious.

The fact that Schanke itself appears to show little difference in F-T processing efficiency as between relatively thick and relatively thin catalyst layers (page 18, lines 25-28 of the reference) argues strongly against this conclusion. Thus the Schanke data provides no support for any reasonable expectation that the conversion results of that patent could be improved through the use of the Dettling catalysts.

More importantly, even if such a substitution were in fact made, the Applicants' process would still not be shown or suggested. That is because the resulting process would still be an F-T conversion process, i.e., a gas-phase reaction involving combining CO with H_2 rather than a liquid phase process wherein a liquid present in a reactant feed-stream is chemically converted to a different liquid through interaction with the catalyst.

To more particularly point out this essential feature of the present invention, and to thereby clarify the differences between the invention and the cited prior art, the Applicants are amending claim 10 to refer specifically to reactions involving the catalytic conversion of a liquid reactant. This amendment thus clearly distinguishes the claimed subject matter from both Schanke and Dettling, since neither of those references deals with process efficiency improvements in a liquid conversion process.

For the above reasons it is respectfully submitted that the subject matter of claims 10-12, 14 and 18 of the application is neither taught nor suggested by Schanke, Dettling, or any combination thereof within the meaning of 35 U.S.C. §103. Accordingly, reconsideration and withdrawal of the rejection of those claims are respectfully requested.

The Examiner next rejects claims 13 and 17 under 35 U.S.C. §103 as unpatentable over the combination of Schanke and Dettling further in view of Suzumura et al, JP 58-096685 (Suzumura). The Examiner recognizes that neither Schanke nor Dettling discloses a gas-liquid hydrotreating reaction, and therefore points to the hydrotreating process of Suzumura to remedy that deficiency.

That Suzumura alone is insufficient to suggest the invention is evident from the fact that only conventionally channeled honeycombs are illustrated for use in the Suzumura reactor (Fig. 2 of the drawings). The Examiner cites Schanke to suggest the improved mass transfer, selectivity, and conversion efficiency of honeycombs (as opposed to tableted or slurried catalysts), but those advantages are already inherent in the Suzumura disclosure.

What Suzumura as well as Schanke and Dettling still fail to suggest, however, is any effect of honeycomb channel shape on the efficiency of liquid/solid and gas/liquid/solid reactions in honeycomb catalysts. And, the Dettling disclosure of a rounded channel catalyst cannot cure this deficiency because Dettling fails to provide, in its extended discussion of gas treatment processes, any teaching or suggestion whatever that channel rounding can significantly improve the efficiency of processes wherein liquids must be catalytically reacted in the presence of solid catalysts.

For the above reasons it is respectfully submitted that the subject matter of rejected claims 13 and 17 is neither taught nor suggested by the combination of Suzumura with

Schanke and Dettling,, and therefore that the rejection of those claims under 35 U.S.C. §103 should be reconsidered and withdrawn.

The Examiner has next rejected claims 15, 16 and 20 of the application under 35 U.S.C. §103 as unpatentable over the combination of Schanke and Dettling taken further in view of U.S. Patent No. 5,063,0443 to Bengtsson. Schanke and Dettling are applied as in the rejection of claim 10 above, while Bengtsson is relied on to show that various process parameters including various feed stream gas proportions and liquid flow velocities can be used in a catalytic hydrogenation process.

While the Examiner notes the preference for Taylor or plug flow operation in both Bengtsson and Schanke, the principal basis for this rejection appears to be that gas and liquid flow parameters are "result effective" variables in catalytic reactors. That is, in the Examiner's view these variables can readily be optimized to achieve best results, merely through the exercise of ordinary skill.

The gist of the invention as set out in the rejected claims, however, is not that reaction efficiency can be optimized under certain flow conditions in a range. Instead the Applicants have found that, for any one of a number of fixed gas and liquid flow conditions, reaction efficiencies are unexpectedly higher in rounded-channel honeycomb catalysts than in catalysts with square or other angled channel shapes under the same or similar flow conditions (Figs. 3-8 and 10 of the drawings). The fact that this effect obtains over a relatively wide range of liquid flow velocities, gas/liquid ratios, reaction temperatures and reaction pressures (as the Applicants' drawings confirm) is also unexpected, and that is the focus of claims 15, 16 and 20. But nothing in the references suggests that, under a fixed set of gas-liquid flow conditions within a certain flow regime, reaction efficiencies can be improved if rounded-channel honeycombs instead of square-channel honeycombs are used.

For the above reasons it is respectfully submitted that the subject matter of claims 15, 16 and 20 of the application is not obvious from the combination of Schanke, Dettling and Bengtsson, and therefore that the rejection of those claims under 35 U.S.C. §103 should be reconsidered and withdrawn.

The Examiner next rejects claim 19 under 35 U.S.C. §103 as unpatentable over Schanke and Dettling taken with Behl et al., DE 3 735 758 (Behl). Behl was cited to show the use of honeycomb structures to conduct a catalytic stripping process, but the Applicants find no reference to honeycomb catalysts in Behl. The supported catalyst bed used by Behl is characterized as a trickle bed, and appears to consist only of conventional catalyzed alumina or carbon pellets (Examples 1-3 at page 4 and Table I at page 6 of the reference).

However, even if construed to suggest honeycombs, Behl teaches at most the possibility of conducting mass-transfer processes in conventional honeycombs, and thus adds little to Schanke or Dettling. Clearly nothing in Behl supplements the teachings of the latter references in a manner suggesting the improvements in reaction efficiency stemming from the use of rounded corner honeycomb to conduct solid/liquid reactions. Accordingly, it is respectfully submitted that the combination of Schanke, Dettling and Behl fails to suggest the subject matter of claim 19, and therefore that the rejection of that claim under 35 U.S.C. §103 on reference to those patents should be withdrawn.

The Examiner next rejects claims 10-14, 17 and 18 under 35 U.S.C. §103 as unpatentable over Suzumura in view of Dettling. In the Examiner's view it would be obvious to utilize the catalysts of Dettling in the method of Suzumura, in order to avoid "burying" the catalyst too deeply to be effective.

Reconsideration and withdrawal of this rejection is respectfully requested for the reason that the references do not in fact support any reasonable expectation of improved results from the proposed substitution. The "burying" of catalyst in conventional catalyzed honeycombs does not entail any reduction whatever in the surface activity of the "unburied" catalyst; the entire catalyzed channel surfaces of such honeycombs, including the catalyzed corner sections, remain active and available. The sole reason for minimizing catalyst "burying" in accordance with Dettling is simply to avoid the cost of applying extra catalyst that is not used. Therefore there is simply no basis in the references for expecting the Dettling catalysts to have any higher activity than conventional catalysts, either for the gas phase reactions which are the focus of the Dettling disclosure or for the liquid phase reactions of Suzumura.

The Examiner again refers to the Applicants' dependent claims as directed to merely preferred liquid velocities and gas/liquid ratios, but as noted above those claims do not define only preferred ranges. They also reflect the Applicants' finding that the enhanced conversion results exhibited by rounded channel honeycombs is observed over quite a large range of honeycomb catalyst operating space. Again, such a finding is not suggested by the references.

For the above reasons the Applicants courteously submit that their finding of enhanced conversion efficiencies in liquid phase reactions conducted in rounded channel honeycombs is entirely unexpected from the combined teachings of Suzumura and Dettling. Accordingly reconsideration and withdrawal of the rejection of claims 10-14, 17 and 18 under 35 U.S.C. §103 as unpatentable over Suzumura in view of Dettling are respectfully requested.

Finally, the Examiner has rejected claim 19 of the application under 35 U.S.C. §103 as unpatentable over the combination of Suzumura and Dettling taken with Behl. Reconsideration and withdrawal of this rejection is respectfully requested for the reasons recited above in connection with the rejection of claim 19 on reference to Schanke, Dettling and Behl. That is, Behl contains no clear disclosure of the use of honeycomb catalysts to conduct stripping or other conventional mass transfer processes, and certainly fails to teach or suggest any performance advantage that might arise from the use of rounded corner honeycombs in such processes. Accordingly it is respectfully submitted that the subject matter of claim 19 is not obvious from Suzumura, Dettling and Behl within the meaning of 35 U.S.C. §103, and therefore that the rejection of that claim on those references should be withdrawn.

In light of the foregoing amendments and remarks, the Applicants respectfully submit that the remaining claims of this application are now in condition for allowance. Accordingly favorable reconsideration of this application and the issuance of a Notice of Allowance herein are courteously solicited.

Applicants believe that no extension of time is necessary to make this Reply timely, but contingently request that the Office grant such additional time extension pursuant to 37 C.F.R. § 1.136(a) as may be necessary to make this Reply timely, if in fact such an additional extension is required. In that contingency the Office is hereby authorized to charge any additional extension fees or surcharges to the deposit account of Corning Incorporated, Deposit Account 03-3325.

Respectfully submitted,

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